

ON THE BIOLOGY OF CAVE INHABITING ANTILLOCORINI WITH
THE DESCRIPTION OF A NEW SPECIES FROM NEW GUINEA
(HEMIPTERA: LYGAEIDAE)¹

JAMES A. SLATER

Section of Systematic and Evolutionary Biology,
University of Connecticut,
Storrs, Connecticut 06268

Abstract.—*Botocudo cavernicola* is described as a new species from bat guano in a cave in New Guinea. Comments on the cave habitat are included. This is thought to be the first record of a lygaeid inhabiting caves in the Eastern Hemisphere. The biology of *Cligenes subcavicola* Scudder, Darlington and Hill is discussed. It is reported to feed on the seeds of *Piper* sp. found in bat guano in caves and abandoned buildings on Trinidad. The species is reported from a cave in Peru for the first time where it feeds at least in part on the seeds of species of *Ficus*.

The only species of Lygaeidae previously known to inhabit caves is *Cligenes subcavicola* Scudder, Darlington and Hill. Recently I have had the opportunity to observe this species in the field in Trinidad.

Through the kindness of Mr. W. R. Dolling and Dr. T. E. Woodward I have also been able to study a species that inhabits a bat cave in New Guinea and which is described below as a new species. To my knowledge these are the only lygaeids thus far known to live in caves where presumably both feed on mature seeds that have passed through the digestive tracts of frugivorous bats.

All measurements are in millimeters.

***Botocudo cavernicola*, new species**
(Fig. 1)

Body broadly elliptical. Head, pronotum, scutellum, antennal segments I, II, and III, abdomen and thoracic pleura bright red brown. Apex of scutellum white. Base of head between ocelli darker. Hemelytral ground color white; area within corial furrow nearly to outer closely set row of punctures translucent, widening posteriorly. Corium with strongly contrasting red brown markings as follows: posterior $\frac{3}{4}$ of lateral corial margin; a large transverse

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vitta at level of claval commissure extending broadly along lateral margin, extending mesad to corial furrow and continued caudo-mesal along outer margins of translucent area to reach apical corial margin just laterad of where apical margin becomes strongly concave; remainder of apical corial margin red brown terminating in a very large brown terminal macula. (This coloration thus creating a large white ovoid spot distally on corium.) Membrane translucent. Legs and labium uniformly pale yellow. Fourth antennal segment (except for base) white. Pronotal and scutellar punctures colored as rest of surface; hemelytral punctures dark red brown. Body lacking upstanding hairs; dorsal surface nearly glabrous but with scattered, very short, sericeous hairs present, these more prominent on head, where anteriorly directed.

Head non-declivent, tylus nearly attaining distal end of first antennal segment. Eyes sessile, in contact with antero-lateral pronotal angles. Length head 0.50, width 0.68, interocular space 0.40. Pronotum broadly trapezoidal, lateral margins very strongly narrowing anteriorly, slightly sinuate; no transverse impression; posterior margin evenly and shallowly concave. Length pronotum 0.68, width 1.40. Scutellum lacking a median elevation. Length scutellum 0.84, width 0.81. Hemelytra with lateral corial margins nearly straight, explanate. Apical corial margin deeply concave on inner third. Membrane slightly exceeding end of abdomen. Length claval commissure 0.20. Midline distance apex clavus-apex corium 0.70. Midline distance apex corium-apex membrane 0.60. Metathoracic scent gland auricle strongly bent posteriorly, acute at distal end. Evaporative area small, occupying only a small area around auricle, outer margin slightly convex. Fore femora slender, mutic. Labium extending well between mesocoxae. Length labial segments I 0.40, II 0.46, III 0.36, IV 0.26. Antennae slender, terete. Length antennal segments I 0.36, II 0.66, III 0.56, IV 0.66. Total body length 3.40.

Holotype ♀. PAPUA NEW GUINEA: West Sepik District of Tedi nr. Tabubil VII-IX.1978 (N. Plumley) (Woltem Cave: on moist guano). In British Museum (Natural History). Paratype: 1 female. Same data as holotype. In J. A. Slater collection.

Discussion. This strikingly colored species is readily separable from any *Botocudo* species yet described from the Eastern Hemisphere. It is larger than any known species; of those previously described only *assimilans* Bergroth (Philippines) exceeds 3 mm in length. However, *assimilans* has a bicolored pronotum in which the posterior pronotal lobe has a broad whitish fascia and brown rather than pale yellow front legs. Bergroth (1918) relates *assimilans* to *signandus* Distant.

China (1930) in his description of *swezeyi* from Samoa states that it is "readily distinguishable from all other species by the uniformly red-brown pronotum and scutellum." This is true of *cavernicola*. However, the two species are readily distinguishable. *B. swezeyi* is only 2.3 long (the subspecies

major reaches 2.7), has a fuscous brown rather than white fourth antennal segment, shining meso- and metapleura and dark spots on the pronotal humeri. The illustration in China's paper shows a straight apical corial margin but this is probably an artist's error.

The most interesting feature of this new species is its habitat. It is the first species of lygaeid that, to my knowledge, has been taken in a cave in the Eastern Hemisphere.

Mr. Noel Plumley who collected the type material has kindly sent me information on the habitat from which the material was taken. Woltem Cave is located at 5°14'S, 141°13'E in the Victor Emanuel Region of Papua New Guinea. The lygaeids were taken from bat guano in the entrance series near where a stream bed enters. The guano in the area was damp, moderately firm in consistency and probably no more than 5 cm in depth. A large number of small seeds similar in size to millet seeds were present in this guano. Mr. Plumley says that a large species of flying fox inhabited part of the entrance series. It is probable that droppings from these flying foxes provided the seeds upon which the insects were feeding. A smaller bat species occurred deeper in the cave but lygaeids were not collected in that area.

Thus we appear to have the independent acquisition of members of the same lygaeid tribe of the habit of feeding in caves upon seeds that have passed through the digestive tracts of the fruit eating bats.

Cligenes subcavicola Scudder, Darlington and Hill

Scudder, Darlington and Hill (1967) described *Cligenes subcavicola* from the Tamana Caves in Trinidad. This was the first record of a lygaeid living and breeding in underground caves. The Tamana Caves are limestone caves inhabited by both insectivorous and frugivorous bats. *C. subcavicola* was reported as living on the floor of the cave on and in the surface layers of bat guano in large numbers, in some instances reaching a density of the order of 100,000 per square meter. These authors did not establish the feeding habits but did suggest that they may have been feeding on the many seeds present in the guano or that they were predatory upon organisms in the guano. They described the egg and commented upon features of the nymphs.

A year after the publication of Scudder, Darlington and Hill's paper Drs. C. W. and L. B. O'Brien collected a series of *C. subcavicola* from Lechuzas Cave in Peru (Cueva de Lechuzas, Huanuco Province, near Tingo Maria, 12.VII.1968, C. W. and L. B. O'Brien).

Three years later Dr. R. T. Schuh visited Lechuzas Cave and has been kind enough to make his field notes available to me. In general his obser-

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vations agree with the situation at the Tamana Caves on Trinidad and at Woltem Cave in New Guinea. Dr. Schuh's notes indicate that the main part of the cave is divided into two distinct caverns. The first chamber is large (about 150–200 feet long) and rather cubic in design with considerable light entering from the outside. The second chamber is somewhat smaller with very little light present. The lygaeids were concentrated in the outer two-thirds of the first chamber. The floor of the cave in this area was almost devoid of large seeds which are primarily those of palm and laurel fruits. These form the principal dietary items for the oil birds *Steatornis*, which occupy the inner portion of the first chamber and all of the second. The floor of the outer two-thirds of the first chamber consisted of thousands of tiny seeds mixed with soil and bat and parrot guano. Dr. Schuh found the *Cligenes subcavicola* population to be almost exclusively confined to this outer area of the cave where they occurred in "unbelievably large numbers" (one bagful of soil collected contained literally (!!!) thousands of lygaeids) and could be found in the "soil" to a depth of 3–4 inches.

Dr. Schuh feels that a great proportion of the small seeds in the lygaeid habitat were of one or more species of *Ficus*.

It is of interest to note that Dr. Schuh also collected litter living lygaeids immediately outside the cave, in fact inside the outermost overhang of the cave. He found small seeds in the litter and a species of rhyparochromine present but not a single specimen of *Cligenes subcavicola*. This is an additional indication that the latter may be confined to caves and other closed habitats where bat guano is present.

Recently Dr. R. M. Baranowski discovered a large breeding colony of *subcavicola* in an abandoned building at the Simla Subtropical Station in the Arima Valley of the North Range on Trinidad. Our collecting party (R. M. Baranowski, R. Clayton, M. Hassey, J. and E. Slater) visited this site on August 23, 1982. The building is constructed of concrete blocks. It apparently was used for photography and sound control work as there is a single entry with an interior wall to screen out light. The interior is completely dark during daylight hours. It is functionally a "cave" and is known to local investigators as the "bat house" because of the large colony of bats present. *C. subcavicola* is abundant on and in the upper layers of bat guano as described by Scudder et al. (1967). The insects climb upward for a foot or more on the vertical walls and move about actively, each carrying a small seed impaled on the end of the rostrum. Most of these seeds are of a species of *Piper*, the fruit of which forms a considerable part of the diet of the frugivorous bats inhabiting the building. Nymphs of all instars were present and there is no doubt but that this is a thriving population that is feeding upon seeds that have passed through the digestive systems of the bats.

The occurrence of *Cligenes subcavicola* in caves as far removed from each other as Trinidad and Peru raises at least two questions. (1). Is the species

confined to caves? (2). If it is there must still be considerable dispersal or the populations would presumably show geographic differentiation.

C. subcavicola as noted by Scudder et al. (1967) does not show any of the adaptations usually associated with true cavernicoles such as loss of body pigmentation and reduction of the wings, eyes, and ocelli. The insects also do not occur in the deeper parts of either the Tamana or Lechuzas Caves. This suggests that they may not be confined to caves. When the first report appeared I had thought this was primarily an adventitious adaptation to a plentiful food source. However, the occurrence of the same species in bat guano in two separate places in Trinidad and in a cave in Peru together with its complete absence in collections from any other habitat (including light traps where many other antillocorines are taken in abundance) suggests that the occurrence is certainly not fortuitous but an adaptive strategy of the species.

The degree of host specificity in the Antillocorini is also very poorly understood. The only other species of *Cligenes* (*distinctus*) does appear to be restricted to fallen seeds of various species of *Ficus*. I have collected long series of this species on several islands of the West Indies and in southern Florida, always in this habitat.

Botocudo cavernicola also does not show any obvious adaptations to cave dwelling. It is in fact one of the more brightly colored species of *Botocudo* with large eyes and ocelli. It will probably prove to have similar habits to those of *Cligenes subcavicola*.

The carrying of small seeds on the end of the rostrum by *Cligenes subcavicola* is very reminiscent of the actions of species of *Stilbocoris* in Africa. Carayon (1964) has given a fascinating account of the activity of members of this genus. Here the male injects salivary secretion into the mature fallen seeds of *Ficus* and offers the softened seed to the female who only then will allow the male to copulate. *Cligenes subcavicola* (and probably also *Botocudo cavernicola*) can be readily maintained in laboratory culture and it would be valuable to know if the complex behavior found in species of *Stilbocoris* is more widespread in the Rhyparochrominae.

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